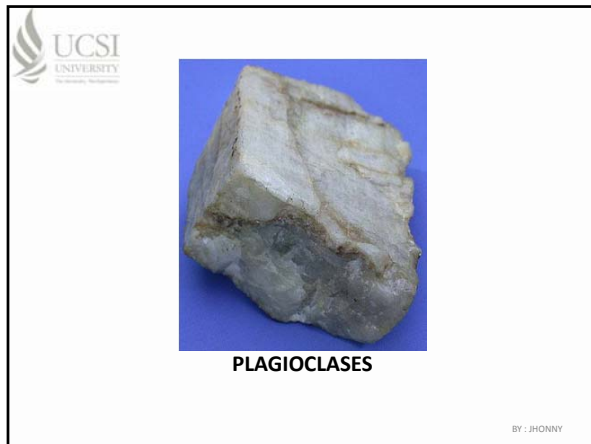
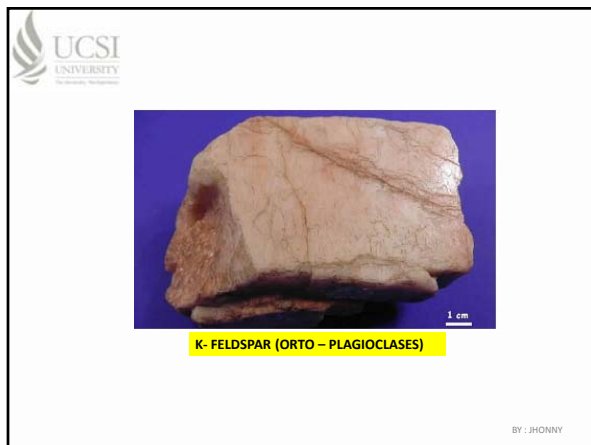










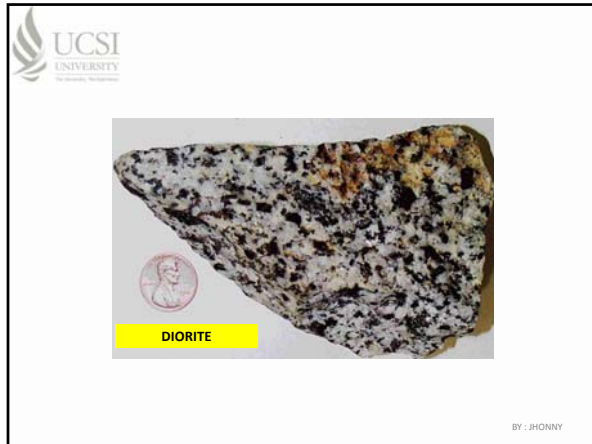












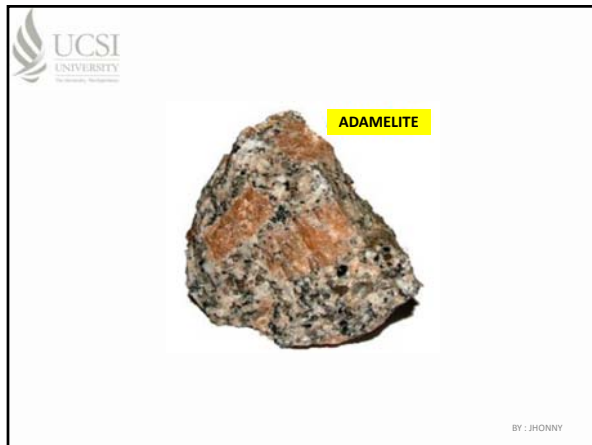






Table 14.5
APPROXIMATE MINERAL COMPOSITIONS OF SOME PLUTONIC ROCK TYPES (IN VOLUME PERCENT)*

	Granite	Syenite	Granodiorite	Quartz Diorite	Diorite	Gabbro	Olivine Diabase	Diabase	Dunite
Quartz	25		21	20	2				
Orthoclase and microperthite	40	72	15	6	3				
Oligoclase	26	12							
Andesine			46	56	64				
Labradorite						65	63	62	
Biotite	5	2	3	4	5	1		1	
Amphibole	1	7	13	8	12	3		1	
Orthopyroxene				1	3	6			2
Clinopyroxene		4		3	8	14	21	29	
Olivine						7	12	3	95
Magnetite	2	2	1	2	2	2	2	2	3
Ilmenite	1	1				2	2	2	
Apatite	Trace	Trace	Trace	Trace	Trace				
Titanite	Trace	Trace	1	Trace	Trace				
Color Index†	9	16	18	18	30	35	37	38	96-100

*After Larsen, E. S., 1942, in *Handbook of Physical Constants*, Birch, F., Schairer, Y. F., and Spicer, H. C. (eds.), Geological Society of America, Special Paper 36, Table 1.2, p. 3. The percentage values are based on grain counts of minerals in a thin section using a polarizing microscope. This is known as *modal analysis*.
†Color index—a number that represents the percentage, by volume, of dark-colored (i.e., mafic) minerals in a rock.

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Nepheline syenite

Oxide	Nepheline syenite	Syenite	Granite	Tonalite	Diorite	Gabbro	Peridotite	Dunite
SiO ₂	54.83	59.41	72.08	66.15	51.86	48.36	43.54	40.16
TiO ₂	0.39	0.83	0.37	0.62	1.50	1.32	0.81	0.20
Al ₂ O ₃	22.63	17.12	13.86	15.56	16.40	16.84	3.99	0.84
Fe ₂ O ₃	1.56	2.19	0.86	1.36	2.73	2.55	2.51	1.88
FeO	3.45	2.83	1.67	3.42	6.97	7.92	9.84	11.87
MnO	trace	0.08	0.06	0.08	0.18	0.18	0.21	0.21
MgO	trace	2.02	0.52	1.94	6.12	8.06	34.02	43.16
CaO	1.94	4.06	1.33	4.65	8.40	11.07	3.46	0.75
Na ₂ O	10.63	3.92	3.08	3.90	3.36	2.26	0.56	0.31
K ₂ O	4.16	6.53	5.46	1.42	1.33	0.56	0.25	0.14
H ₂ O	0.18	0.63	0.53	0.69	0.80	0.64	0.76	0.44
P ₂ O ₅	—	0.38	0.18	0.21	0.35	0.24	0.05	0.04
Total	99.77	100.00	100.00	100.00	100.00	100.00	100.00	100.00

*All analyses except the nepheline syenite from Nockolds, S. R., 1954, *Geological Society of America Bulletin*, v. 65, pp. 1007-1032.

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Igneous rocks are also classified by their chemical compositions. There are four general types:

- **Felsic**
High in silica (65% +)
Usually light-colored.
Examples: Rhyolite (extrusive) and granite (intrusive)
- **Intermediate**
Lower silica content (55-65% or so)
Darker than felsic, lighter than mafic.
Examples: Andesite/dacite (extrusive) and diorite/granodiorite (intrusive)
- **Mafic**
Low silica content (45-55% or so)
Usually dark-colored
Examples: Basalt (extrusive) and gabbro (intrusive)
- **Ultramafic**
Extremely low silica content (less than 45%)
Usually dark-colored, but high olivine content can lend green colors. Other rare colors can be found.
Examples: Peridotite (intrusive)



Thank You
To be continue ...

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